1.0 Washington's Electricity Landscape

Washington's economy and quality of life share with the rest of the nation a great dependence on the availability of high quality, reliable and affordable electricity service. However, Washington's electricity industry differs from the rest of the nation's in some important respects. While electricity service in most of the nation is dominated by relatively large investor-owned utilities with state-certified monopoly service territories, Washington's utilities are a diverse mix of both size and ownership, none of which have a state-certified monopoly service territory. The majority of electricity service is provided by utilities that are owned by consensus and locally controlled.

Figure 1.1 Kilowatt-Hours sales by Utility Type - Washington, 1996

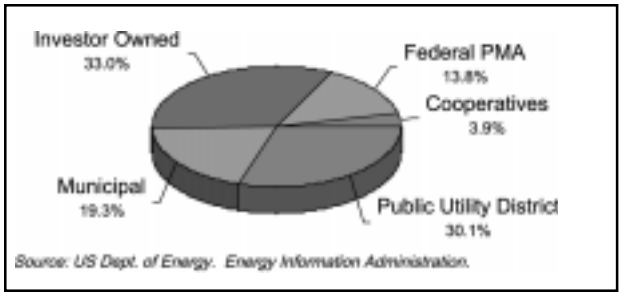
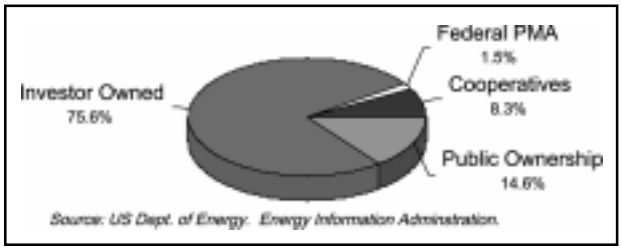


Figure 1.2 Kilowatt-Hours sales by Utility Type - USA, 1996



While most of the nation is served by electricity generated from fossil fuel or nuclear sources, Washington's electricity industry is dominated by hydropower, which accounts for roughly a third of the nation's total hydropower generation. While this is a benefit of our geography, it comes with a cost. Hydropower development on the Columbia, Snake and other rivers is marked by one of the nation's most controversial environmental problems: survival and restoration of salmon populations. Our reliance on hydropower also complicates energy planning and policy because water, the fuel for power generation, is not only unpredictable in supply, but is also a multiple-use resource important for irrigation, transportation, recreation, and other uses.

Figure 1.3 Electricity Generated in Washington

Percent of total: 1996 Data

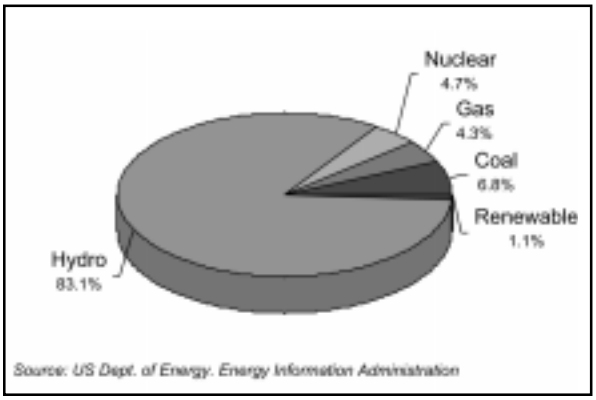
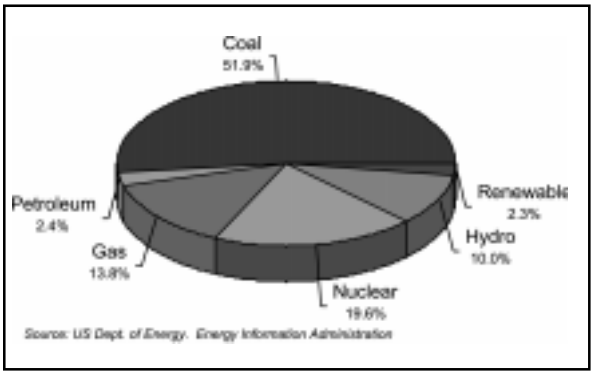


Figure 1.4 Electricity Generated in USA

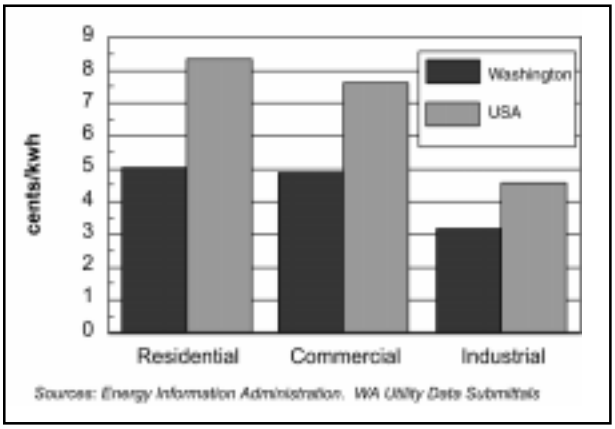
Percent of total: 1996 Data



Few other states in the nation are as dependent as ours on federal facilities that generate and transmit electricity. More than half of the power generation and 80 percent of the high-voltage transmission serving Washington comes from the Bonneville Power Administration (BPA).

Figure 1.5 Average Rates Compared

Washington vs. United States



Finally, perhaps the most important distinquishing feature of Washington's electric power system is our low power rates. Our reliance on hydropower, federal power resources, and a diverse mix of public and private utilities produces among the lowest electricity rates in the nation.

1.1 Washington Utility Demographics

1.1.1 Utility Organization and Ownership

In 1996, Washington had more than 2.5 million electricity customers served by more than 60 utilities. These utilities vary greatly in size, ranging from Northern Lights Cooperative (an Idaho-based cooperative) which serves 14 customers in Pend Oreille County, to Puget Sound Energy which serves 864,462 customers in the Puget Sound area. The dozen largest utilities, together with the BPA's 10 direct service industries, account for about 85 percent of the state's customers and electricity use.

Figure 1.6 Customers By Utility Type - Washington, 1996

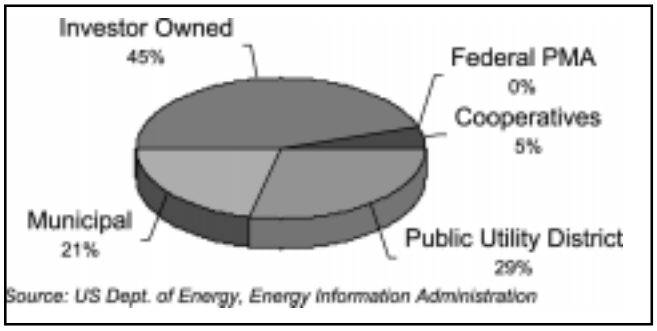
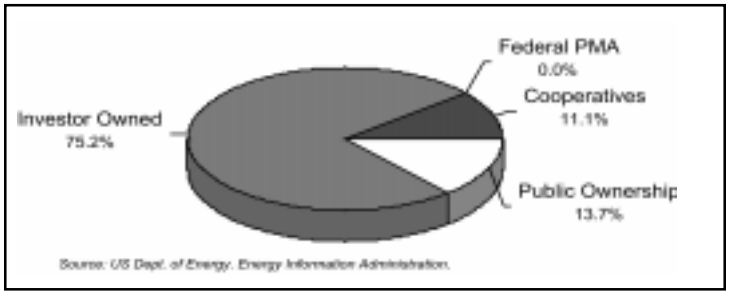


Figure 1.7 Customers By Utility Type - USA, 1996



Except for the Bonneville Power Administration, the various retail utilities in Washington are authorized and governed by a number of sections of state law. General service requirements and standards for the three investor-owned electric utilities are set out in chapter 80.28 RCW. These are the only utilities whose rates, terms and conditions of service are regulated by the state under jurisdiction of the Washington Utilities and Transportation Commission (UTC). Municipal utilities, public utility districts, cooperative and mutual corporation utilities, irrigation districts and port districts are governed by combinations of the provisions of Title 80 RCW and specific enabling legislation. The municipal utilities are locally regulated as functions of city government authorized by Title 35 RCW. Public Utility Districts are locally

regulated by elected county officials as authorized by Title 54 RCW. Cooperative and mutual corporations are locally regulated by membership boards and governed by chapters 23.86, 24.06, or 87.03 RCW. Fifty-five percent of Washington's electricity customers and sales are served by locally-controlled and regulated utilities.

Washington also has the largest number of utility control areas of any state in the Western U.S. A utility "control area" is the technical term for a geographical area of the electricity grid that is managed closely to ensure that all loads and generation are kept in balance at all times. These areas are components of the management framework by which the Western System Coordinating Council (WSCC) monitors and maintains electricity reliability throughout 14 Western states. To understand Washington's utility landscape, the technical details of control area operation are not as important as the fact that the state contains 9 such areas. These areas may contain a number of individual utilities, or they may contain only one. Current technology and practice requires that scheduling of transmission between these control areas be for transfers of no less than 1 MW. Under current technology and practice, individual customers or aggregations of customers seeking competitive electricity supply would need to represent at least 1 MW of load in any control area. Control areas are operated in Washington by Seattle City Light, Tacoma Power, Puget Sound Energy, PacifiCorp, Grant County PUD, Chelan County PUD, Douglas County PUD, Washington Water Power, and BPA.

1.1.2 Customer Characteristics

Washington's utilities serve approximately 2.6 million customer accounts. Of these, residential homes and apartments represent 88 percent of the total. Commercial customers (including medium-sized businesses, schools, hospitals, offices and retail stores) make up 10 percent of accounts, and large industrial customers, street lighting and irrigation make up the remaining 2 percent. The proportion of sales to commercial and industrial customers exceeds their share of the customer base, reflecting higher electricity usage levels of these customers. These customer class proportions are especially influenced by the 10 large industrial accounts served directly by BPA or over BPA transmission.

Figure 1.8 Washington Customers by Sector
Washington - 1996

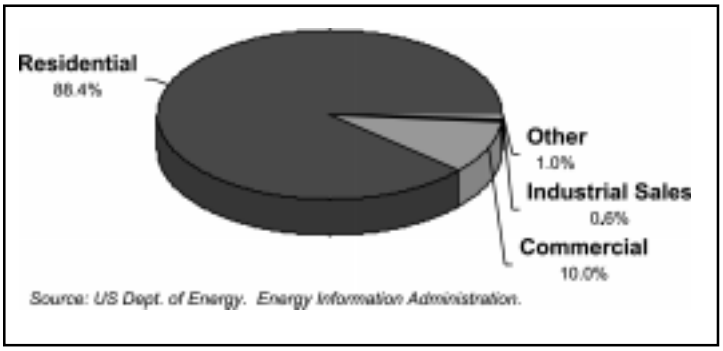
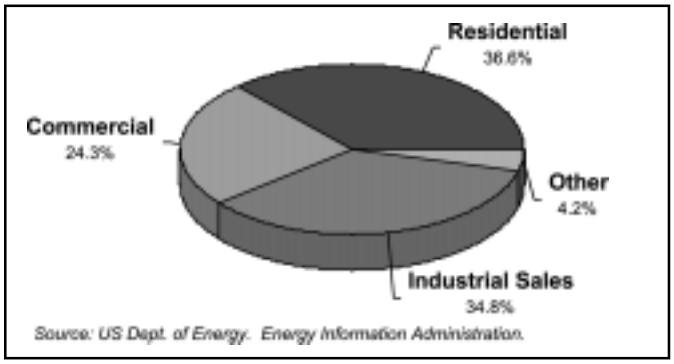


Figure 1.9 Proportion of Washington Electricity Use by Customer Class
Washington - 1996



The wide variation in per-customer electricity consumption among the customer classes is further described in Table 1.10. Based on data reported by utilities, the table depicts the number of customers whose annual electricity usage (kWh) or electricity demand (kW) falls within the specified range. The majority of electricity customers (65 percent) use fewer than 10,000 kWh annually. Some proposals recently discussed for introducing competition in retail electricity service establish a threshold of 1 aMW. Table 1.10 indicates that about 300 customers use more than 1 aMW of electricity annually. Among customers metered and billed on the basis of peak demand, the utilities report that 765 register an annual peak demand of 1 MW or more. The figures in this table represent a sample of more than 90 percent of Washington's electricity customers. So, while the figures in Table 1.10 capture the pattern of customer electricity use, they do not represent complete state totals.

Table 1.10 Distribution of Customers by Annual kWh and Annual Peak kW.

KWh (000)	# of Customers	Cumulative %	Peak KW	#of Customers	Cumulative %
0 to 9	1,460,749	64.98	0 to 99	12,981	52.2
10 to 49	739,478	97.88	100 to 149	3,958	68.2
50 to 99	18,699	98.71	150 to 199	2,079	76.5
100 to 200	11,621	99.23	200 to 249	1,234	81.5
200 to 499	10,129	99.68	250 to 299	852	84.9
500 to 999	3,617	99.84	300 to 349	645	87.5
1000 to .5 aMW	2,749	99.96	350 to 399	496	88.5
.5 to 1 aMW	477	99.99	400 to 449	414	91.2
1 to 2 aMW	166	99.99	450 to 499	310	92.4
2 to 4 aMW	78	100.00	500 to 999	1,118	96.9
> 4 aMW	70	100.00	> 1 MW	765	100.0
Total in Sample	**2,247,833**			**24,852**	

Source: 6560 Utility Data Survey
Note: Customers reported by peak kW demand are only those metered and billed for demand.
Note: Does not include BPA direct service industrial customers.

1.1.3 Metering

For billing purposes, utilities install many types of meters to keep track of customer usage. Most meters measure only total accumulated electricity use and peak electricity demand for commercial and industrial accounts. They do not typically record when electricity is used. The capability of installed metering to provide time-of-use information is a key consideration when utilities offer new kinds of service, such as time-of-use pricing or competitive access to alternative electricity providers. According to data provided by utilities for this report, fewer than 2,000, of more than 2.2 million, meters installed in Washington are capable of recording time-of-use to at least an hourly level of precision. Table 1.11 indicates that the majority of these meters are in the commercial and industrial sectors.

Table 1.11. Distribution of Standard and Time-of-Use Meters, by Customer Class.

(Number of meters. [Fraction of meters in class])

	Residential	Commercial	Industrial	Total
Standard (Cumulative kWh/kW)	1,967,735	213,852	9,191	2,190,778
Time of Use (site or remote read)	642 [<.04%]	875 [.4%]	412 [4.3%]	1,929 [.09%]
Total Meters	1,968,377	214,727	9,603	2,192,707

Source: 6560 Utility Data Survey

While the preceding figures and tables capture the statewide character of utility demographics, they do not capture the diverse character of Washington's electric service providers. Table 1.12 demonstrates that the smaller utilities, mainly cooperatives, serve predominantly residential customers and customers categorized as "other" (often irrigation loads). The investor-owned utilities and PUDs also show a high proportion of residential loads, but have substantial industrial load as well. The municipal utilities demonstrate the most even pattern across the classes. Finally, BPA's retail service in Washington is almost exclusively industrial, the remainder going to federal agencies.

Table 1.12 Proportion of Retail Sales (kWh) by Customer Class for Each Type of Utility.

Utility Type	Residential	Commercial	Industrial	Other	Total
BPA	0.0%	0.0%	93.1%	6.9%	100%
Cooperatives	57.3%	21.4%	3.6%	17.7%	100%
Investor-Owned	45.7%	34.5%	19.4%	0.4%	100%
Municipal	35.4%	25.4%	29.4%	9.8%	100%
P.U.D.	41.5%	24.0%	32.5%	2.0%	100%
Total WA sales	36.6%	24.3%	34.8%	4.2%	100%

Source: Energy Information Administration. 1996.

1.2 Washington Electricity Rates

Electricity rates in Washington are set for investor-owned utilities by the UTC, and by city councils, boards, or other local governing bodies for public utilities. In both cases, rates are fundamentally based on the average cost of providing electricity service. A more detailed discussion of the way in which rates are developed is included in Section 4.0, Electricity Rates and Equity. Before comparing rates among utilities and between the state and the nation, two clarifications are necessary.

First, the *structure* of utility rates — the way in which individual utility bills are calculated — varies significantly among utilities. This variation includes how much revenue is collected from basic charges, capacity demand charges and energy charges. Decisions about how to structure rates in a fair and equitable way are made by state or local regulators based on the nature of the customer-base being served. We have focused our analysis on the average rate. This is the revenue collected from customers divided by customers' electricity usage. The average rate is not affected by variations among utilities in the way customer bills are structured to include basic charges, seasonal energy rates, capacity charges and energy block charges.

Second, utility costs vary depending on the nature of the territory the utility serves. For example, many small rural utilities must maintain distribution systems to serve very dispersed customer loads. This may lead to higher service costs per customer than would be the case for an urban utility. Utility costs also depend on the age of the utility system, which can affect capital costs and the degree of maintenance required. While we have not attempted a detailed study of these differing cost circumstances, it is important to keep them in mind when comparing average rates among utilities.

Two sources of information are used for examining utility average rates. The first is information reported by utilities in response to the 6560 information survey. These data include utility revenue, customer counts and electricity use for each customer class for 1993 to 1997. The utility-reported data were provided by those utilities not exempted from the 6560 legislation, and therefore only covers 12 utilities plus six others that volunteered information. These utilities make up approximately 88 percent of total state utility sales. The remaining utilities include relatively small cooperatives, mutuals, public utility districts, municipal utilities, irrigation districts, and BPA service to a limited number of direct service industries. For these utilities, we have relied on data collected and reported by the United States Department of Energy's Energy Information Administration (EIA). EIA data are reported annually for all utilities based on information reported by the utilities to EIA and other federal agencies. For both the 6560 data and EIA data, utilities categorize information into the basic customer classes: residential, commercial, industrial and other (including street lighting, irrigation and unclassified uses). Based on these two sources, Appendix 1.1 includes average rates for each utility and for each customer class for the years 1993 through 1997. In the following sections, we examine statewide average rates by customer class and utility category, how these rates compare with

national averages, and trends in both state and national rates. Table 1.13 presents statewide average rates for each of the customer classes for each of the years 1993 through 1997.

Table 1.13. Average Rate to Washington Customers 1993-1997, Cents per Kilowatt-Hour

Sector	1993	1994	1995	1996	1997
Residential	4.63	4.95	5.01	5.08	5.01
Commercial	4.50	4.70	4.81	4.92	4.82
Industrial	2.97	3.16	3.25	3.19	3.07
Other	4.03	3.96	4.27	4.21	4.49
All Sectors	4.14	4.38	4.47	4.53	4.44

Sources: Utility Data Reported to 6560 Study.

Taking 1996 as a year for comparison, Table 1.14 compares Washington average rates with national averages for each customer class. For all customer classes, Washington is not only substantially below the national average, but when all states are ranked, Washington is the lowest or near the lowest in all categories.

Table 1.14 Washington Electric Rates Compared to National Average - 1996

(Ranked by statewide rates, where 1=lowest; 50 states + District of Columbia)

Category	Washington Rank	WA average rate (cents/kwh)	US average rate (cents/kwh)
Residential	1	5.0	8.4
Commercial	2	4.9	7.6
Industrial with BPA	2	2.9	4.6
Industrial without BPA	2	3.0	4.6
All Sectors	3	4.5	6.9

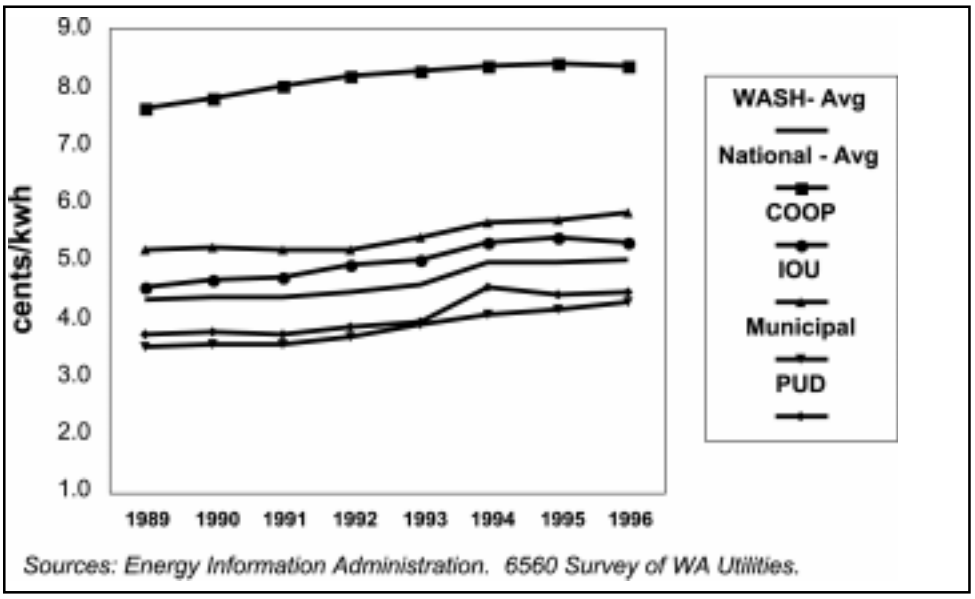
Source: Electric Sales and Revenue 1996, DOE/EIA-0540.

EIA data includes all customers, so is more complete than data reported for 6560.

1.2.1 Residential Rates

All utilities reporting information in our study offer a basic residential rate to homes and apartments for standard domestic uses. A few utilities offer more than one residential rate depending on such factors as electric space and water heating, but, in general, a single tariff covers utility service to the residential class. Figure 1.15 compares statewide residential average rates with the national average for the years 1989 through 1996. During this period, the national average rate increased by 0.71 cents/kWh or about 9.3 percent. For comparison, during the same period the Consumer Price Index measurement of inflation increased by nearly 35 percent. The Washington residential average rate also increased over this period by 0.70 cents/kWh. On a percentage basis this increase is 16.3 percent. The percentage increase may be higher for Washington than the nation because our average rates started at a lower level.

Figure 1.15 Residential Rates



Sources: Energy Information Administration. 6560 Survey of WA Utilities.

Figure 1.16 Range in Washington Residential Rates
Compared to National Average

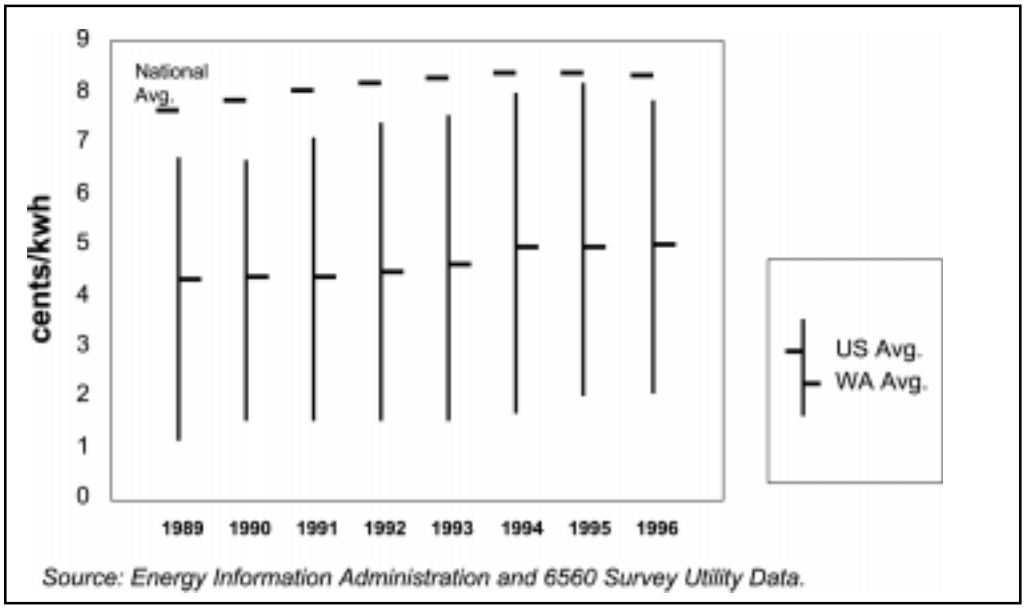


Figure 1.15 also plots statewide averages for each major category of utility. Differences in these rates reflect not only differences in utility costs related to type of ownership, but also the nature of the areas being served. Typically, cooperatives and relatively small public utilities serve rural areas and the municipals serve urban areas. The investor-owned utilities serve a mix of urban and rural areas as do many of the public utility districts. While there is variation in average rates among the utility types, all show modest upward trends in average rates; all are substantially below the national average.

Figure 1.16 takes a more detailed look at variation among the state's 60-some utilities by plotting the full range of average rates in comparison to the national average. This figure demonstrates that even those utilities having the highest residential rates in Washington are still lower than the national average.

The average rate paid by residential customers does not reveal very much about the average customer's actual electricity bill. Table 1.17 examines average annual electricity usage for Washington residential customers in 1996, as well as the average annual bill. Both of these figures are compared with national averages. This comparison points out that the average annual electricity bills of Washington residential customers are also below the national average, but not by as much as our rates. This is because customers in Washington use about 33 percent more electricity per year than the national average, probably as a consequence of our low rates, and possibly because of a lack of natural gas availability for some utility customers in rural areas.

Table 1.17 Average Annual Residential Electricity Use and Bill.

	Annual Use (kWh)	Annual Bill ($)
Washington Average	14,000	710
National Average	10,300	859
WA Investor-owned	12,900	750
WA PUD	17,000	756
WA Municipal	12,200	521
WA Cooperatives	16,900	900

Source: Energy Information Administration

Commercial rates serve a very diverse customer sector. Customers in this sector vary from small offices, restaurants, gas stations and grocery stores to high-rise office buildings of millions of square feet. The sector also includes schools, hospitals and government buildings, as well. Most Washington utilities offer a range of rates that include at least a small and large commercial tariff. Some others offer a greater range of services. Eligibility for commercial service tariffs is typically determined by load level, either connected kW load or minimum energy use, or both. Commercial rates typically include both an energy charge and a kW demand charge. Figure 1.18 tracks the total number of commercial tariffs offered by the 18 utilities reporting data to the 6560 study. The number and variety of service tariffs offered in the commercial sector remained relatively constant over the period 1993 to 1997.

Figure 1.18 Commercial Tariffs Offered

As reported for HB 6560 Study

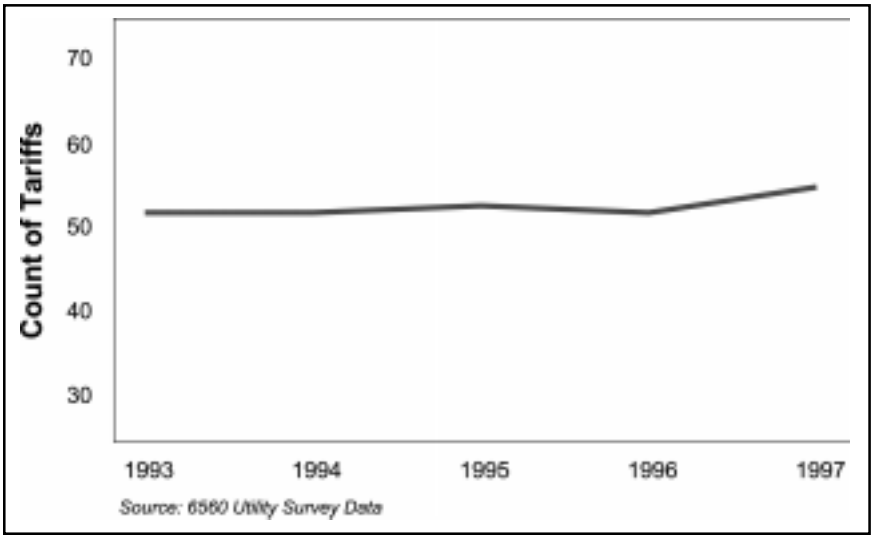


Figure 1.19 compares statewide commercial average rates with the national average for 1989 through 1996. During this period, the national average rate increased by 0.45 cents/kWh or about 6.2 percent. The Washington commercial average rate increased over this period by 0.82 cents/kWh, or 20.0 percent. About half of the difference in percentage increase is again explained by rates starting at a lower level.

Figure 1.19 Commercial Rates

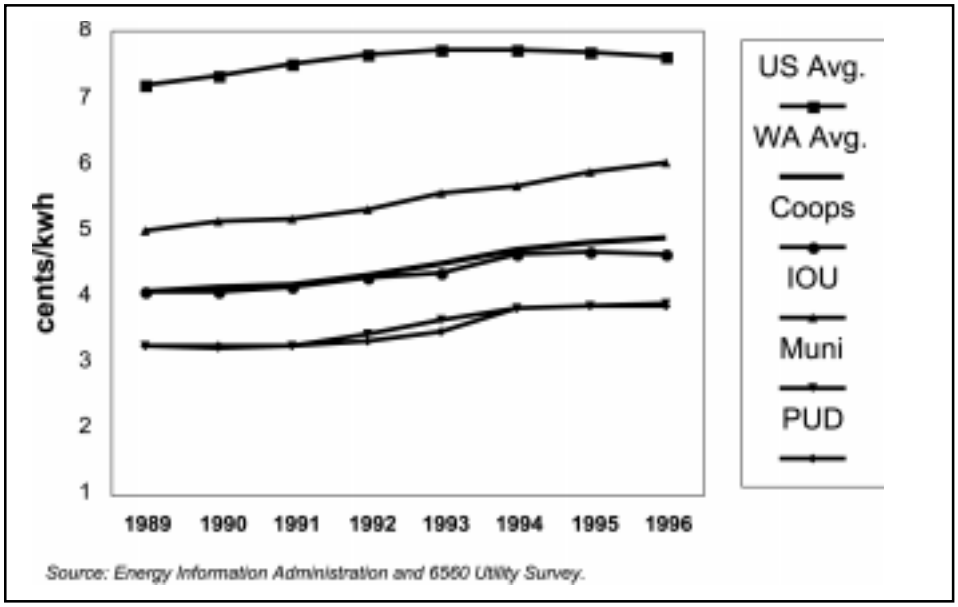


Figure 1.20 Range in Washington Commercial Rates

Compared to U.S. Average

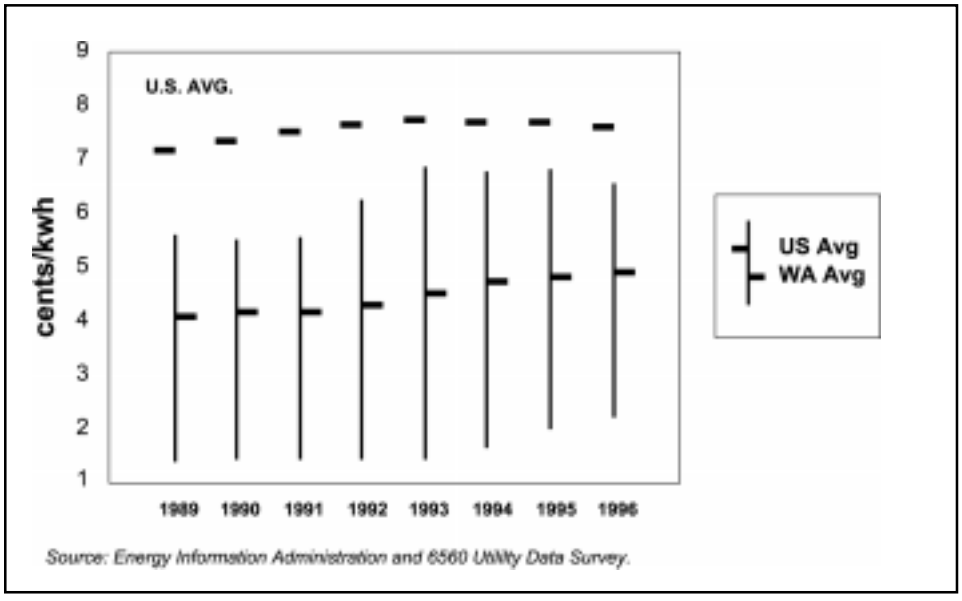


Figure 1.19 also plots the statewide average rates for each major category of utility. Again, the differences in these rates reflects not only the differences in utility costs related to type of ownership, but also the nature of the areas being served. Typically, cooperatives and relatively small public utilities serve rural areas and the municipals serve urban areas. The investor-owned utilities serve a mix of urban and rural areas as do many of the public utility districts. While there is variation among the utility types, all show modest upward trends in average rates and all are substantially below the national average.

Figure 1.20 provides a more detailed look at variation among the state's 60 plus utilities by plotting the full range of average commercial rates in comparison to the national average. This figure demonstrates that even those utilities having the highest commercial rates in Washington are lower than the national average.

1.2.3 Industrial Rates

Industrial class rates present some data interpretation and analysis problems. While utilities traditionally have provided one or more average cost-based tariffs for industrial and other large service loads, recent years have seen an increasing variety of services and pricing in the industrial sector. These include special customer-specific contracts, market-based pricing, and unbundled delivery service. The 6560 study information provided by utilities reported all of these tariffs, contracts and other services separately. We have included all of these categories of service in the overall industrial class averages to reflect what affect they have had on overall industrial class rates. In addition, we have attempted to break these "non-traditional" services out for separate examination later in this section. In the case of unbundled services (retail wheeling) we have not included revenue and delivered kWh in the averages for industrial rates because the data do not include the energy component of service. This portion of service is provided by entities other than the utility based on negotiated prices and, as such, is not reported to either the federal agencies or to the utilities. It is unavailable and therefore cannot be included. This complication was encountered only for Washington Water Power's pilot program.

We have tracked rates charged by BPA to the direct service industries separately. These 10 large industrial customers are the only industrial customers in Washington served directly by the federal government without a state utility intermediary that is regulated either by the UTC, or by a local jurisdiction.

Figure 1.21 presents the total number of industrial class service tariffs reported by the 18 Washington utilities submitting information to the 6560 Study. The number of services offered has grown over the period 1993 through 1997, reflecting the efforts of utilities to tailor services more closely to the specific circumstances of industrial customers.

Figure 1.21 Industrial Tariffs Offered

As reported for HB 6560 Study

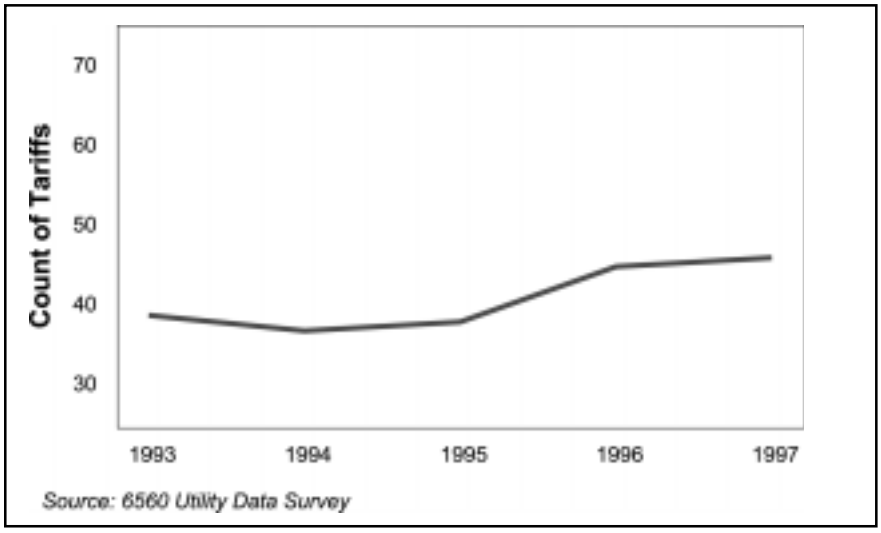


Figure 1.22 compares statewide industrial average rates with the national average for 1989 through 1996. During this period, the national average rate *decreased* 0.12 cents/kWh or 2.6 percent. The Washington industrial average rate, excluding BPA's direct industrial sales, increased over this period by 0.52 cents/kWh, or 19.3 percent. Figure 1.22 also plots the statewide averages of industrial customer rates for each major category of utility, including BPA. The figure demonstrates variation among the utility types due at least in part to the factors cited above for residential and commercial rates. The average rates for all the utility categories show upward trends, but all of the averages remain below the national average.

Figure 1.22 Industrial Rate Comparisons

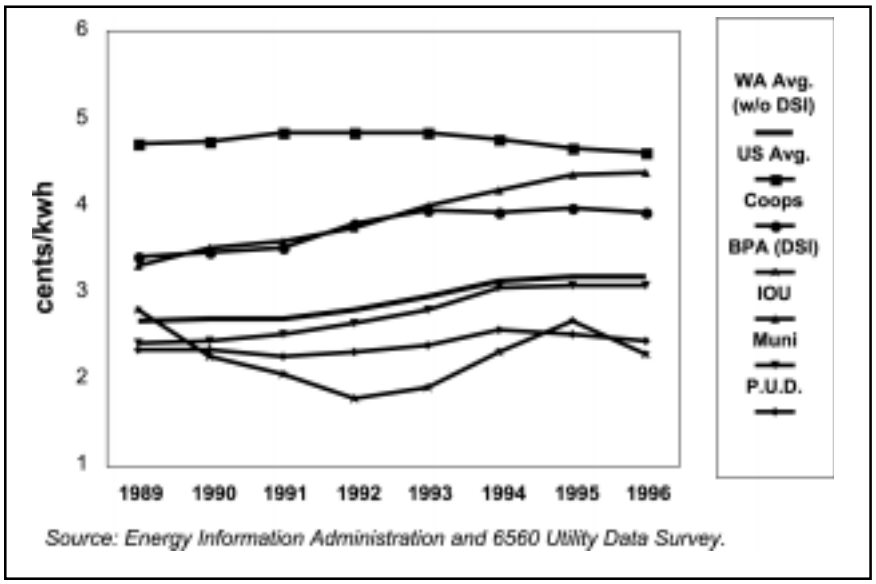


Figure 1.23 Range in Washington Industrial Rates

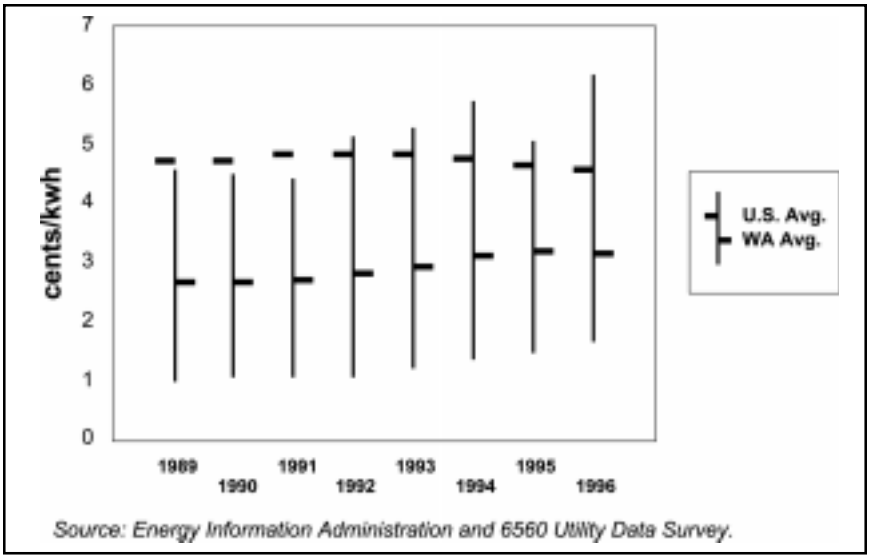


Figure 1.23 provides a more detailed look at variation among the state's 40 plus utilities that offer industrial rates by plotting the full range of average industrial rates in comparison to the national average. This figure demonstrates that, while the average industrial rate is lower than the comparable figure for the nation, the national figure has been declining and the state average increasing. Over the last several years some utilities in Washington are shown to have average industrial rates that exceed the national average.

To examine the trends in services reported by the utilities as non-traditional, Figure 1.24 plots the average rates for service under these tariffs along with average rates for industrial services not characterized by utilities as non-traditional. The term non-traditional tariff was defined in the 6560 survey instructions as "…any departures from bundled service priced at embedded cost including market-based electricity rates, unbundled services, or customer specific special contract pricing."

Figure 1.24 Comparative Rates by Sector

Utilities with Non-tradional Rates

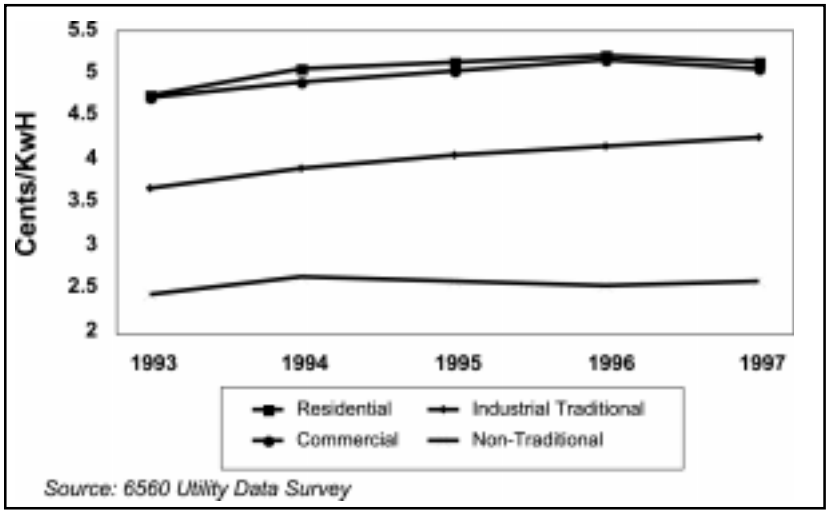
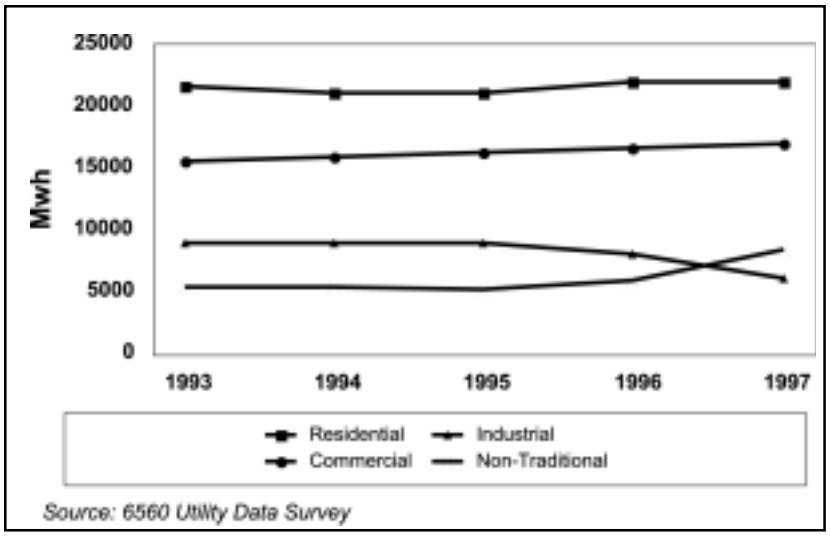


Figure 1.25 Annual MWH Delivered by Sector

Utilities with Non-tradional Rates



Several trends are apparent from these figures. First, a clear shift from traditional, embedded cost tariffs to non-traditional service began in 1995 (Figure 1.25). Second, the average rate for non-traditional service is significantly lower than for traditional industrial service. A pattern of increasing rates for the industrial loads not served under the non-traditional rates is also clear. This trend may represent a cost-shift within the industrial class; it may reflect that loads remaining on traditional service are fundamentally different from those taking non-traditional services, or it may have been due to a BPA rate increase in this time period which was passed through to these customers. The trend towards non-traditional service represents a fundamental change in the way utilities allocate costs and risks among customers and customer classes. Figure 1.24 does not provide evidence that the trend towards non-traditional service has caused rates to *increase* for the commercial and residential classes. However, these classes have not experienced either the rate

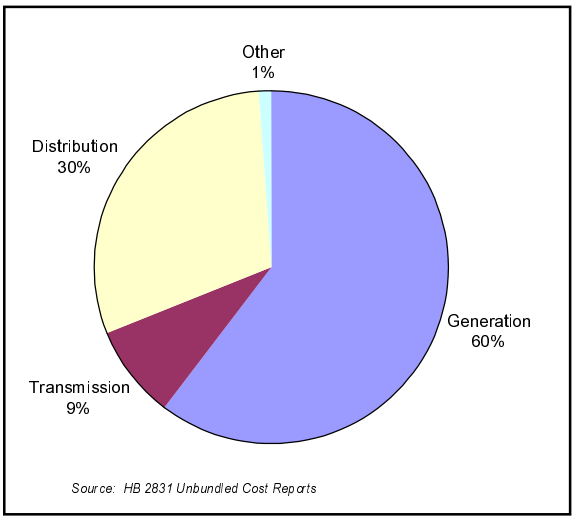
decreases or any changes in risk that customers taking non-traditional service may have over the last three years. This issue is further explored in Section 4.0, Electricity Rates and Equity.

1.3 Costs for Generation, Transmission, and Distribution

The following subsections characterize Washington's costs of electric power service, broken down by generation, transmission, and distribution. These costs underlie the rates discussed above. Most of the data for these characterizations are drawn from the data that utilities reported for the HB 2831 study. In keeping with that study's cost categories, generation costs include demand-side management and control area services. Distribution costs include customer account services and metering and billing.

The pie chart below shows the share of total (internal) costs in each category for the utilities reporting under HB 2831. While all three of these components represent significant costs, generation is both the largest and perhaps the most susceptible to changes associated with recent trends toward competition.

Figure 1.26 Internal Costs by Category for HB 2831 Reporting

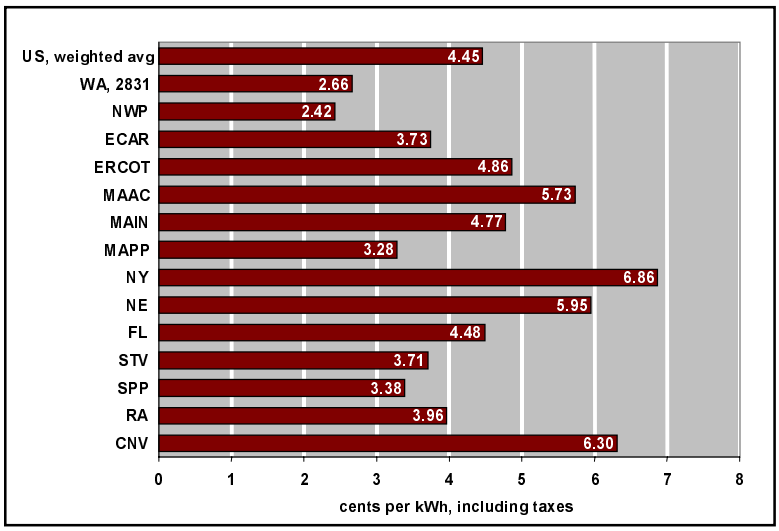


1.3.1 Generation

1.3.1.1 Average Generation Cost for Washington Compared to Other Regions

The most significant factor distinguishing the existing cost profile of Washington's electric power system is the predominance of relatively low-priced electrical generation. The average cost of electrical generation as reported by the utilities submitting unbundled cost data under HB 2831 is 2.66 cents per kWh. The US Energy Information Administration estimates that average cost of electric generation for utilities nationally is 4.45. (EIA figures are derived from National Energy Modeling System modelling runs, rather than actual survey data. We do not know whether EIA groups costs into generation, transmission, and distribution in exactly the same manner as the HB 2831 study.) The average cost of generation in Washington and the Northwest are compared to average costs for generation in other regions in Figure 1.27.

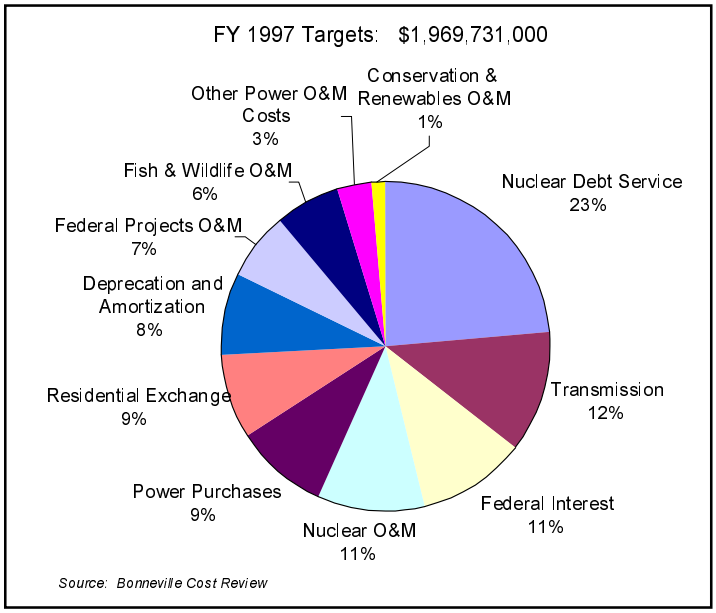
Figure 1.27 Comparison of Generation Costs



1.3.1.2 Preferential Access to Federal Generation Resources at Cost-Based Rates.

Approximately half of Washington's electric power comes from the Federal Columbia River Power System. The price of power from the FCRPS is approximately 2.3¢ per kWh. The FCRPS consists primarily of hydropower. However, while nuclear generation accounts for only 7% of FCRPS output, it represents about one third of the cost of power from the system (including debt service on terminated plants). The costs of the FCRPS also include costs associated with accomplishment of BPA's statutory missions, including the costs of serving low-density rural systems; the costs of mitigating damage to fish and wildlife; and the cost of investments in energy efficiency and new renewable resources. Figure 1.28 shows the breakdown of Bonneville's costs among various categories.

Figure 1.28 Bonneville Power Business Line Expenses



The price of power from the FCRPS has remained relatively low and stable since the system was put into service, with the exception of a dramatic increase in wholesale prices from 1979 to 1983, when the costs of the WPPSS nuclear plants were absorbed in BPA rates. Today's rates are very close to their 1983 level in nominal terms. In real terms, they have declined since 1983.

The difference between the cost of power from the Federal system and its value historically has been quite large. That difference accrues to the beneficiaries of cost-based rates from BPA: Northwest public agencies, the residential and small farm customers of investor-owned utilities, and BPA's Direct Service Industrial customers, primarily aluminum smelters. It is difficult to evaluate how large this difference is likely to be in the future. However, according to the Northwest Power Planning Council, it appears to be substantial under a fairly wide range of assumptions about future market conditions and federal system costs (See Figure 1.29). Intense interest in securing allocations of FCRPS power in the current BPA subscription process confirms the growing perception that the value of this power will continue to exceed its cost.

Figure 1.29 Bonneville Rates, 1960-2000

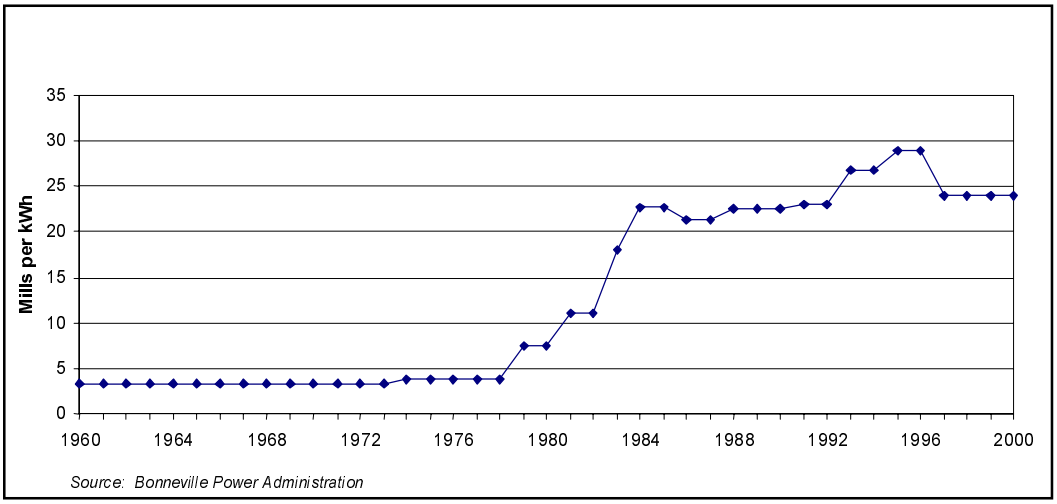


Figure 1.30 shows the long-term value of the FCRPS under a variety of scenarios for salmon recovery strategies and market conditions. As indicated in the chart, market price is probably the most significant uncertainty in assessing the value of the federal system over the next 25 years. In the low market scenario, the real price of power climbs from 17 mills/kWh in 1998 to approximately 19 mills in 2007, before beginning a gradual decline to 13 mills by 2021. In this scenario, the net present value of the federal system is negative for five of eight salmon recovery scenarios studied by the Council. In the high market scenario, where prices climb to 35 mills by 2005 and remain there through 2021, the system is worth several billion dollars under all salmon recovery scenarios. The medium market scenario foresees real prices of 23-25 mills from 2000-2021. Only the most expensive fish cost option, involving a five dam drawdown, flow augmentation, and modification of remaining dams for Clean Water Act compliance, results in a net present value for the system of less than $2.5 billion.

Figure 1.30 Projected Value of Federal System Under Various Scenarios

	Low Market Price	Medium Market Price	High Market Price
■ Reduced Flow Augmentation	$2,045	$9,995	$22,770
□ 95 BiOp	$1,450	$9,201	$21,944
◆ Transportation Plus	$474	$8,253	$21,061
◇ Transportation Plus, Clean Water Act (CWA)	$(994)	$6,784	$19,593
▲ Lower Snake Drawdown	$(1,244)	$5,834	$17,346
△ Lower Snake and John Day Drawdown (Five Dams)	$(2,663)	$3,832	$14,317
● Five Dam Drawdown, CWA	$(3,896)	$2,599	$13,084
○ Five Dam Drawdown, Flow Augmentation, CWA	$(6,219)	$(763)	$8,470

1.3.1.3 The Prevalence of Hydropower in Washington's Resource Mix, and Particularly the Prevalence of Large Hydro Projects

Because Washington is part of an integrated regional grid, it is not possible to determine exactly how much of the electricity generated for Washington consumers is hydropower. However, we can get a good indication by looking at the power generated in a slightly larger region. In the four Northwest states (Washington, Oregon, Idaho and Montana), hydropower accounted for 85% of electric generation in 1996. Of this amount, projects larger than 300 MWa accounted for 77%. For a variety of reasons including scale, these larger projects tend to produce lower-priced power.

1.3.1.4 The Age of Washington's Resource Mix

Very little electric generating capacity has been added in the region in the last decade. As a general rule, older projects tended to have lower construction costs, were financed at lower interest rates, have already amortized much or all of their capital costs, and may have internalized fewer environmental costs.

1.3.1.5 The Prevalence of Publicly-Owned Generation

Publicly-owned generating resources account for nearly three-fourths of total electric generation serving Northwest consumers (again, it is impossible to calculate a mix of resources serving Washington customers alone). These resources were financed with tax-exempt debt and the cost of power from these resources to consumers does not include return on equity (where that power is delivered by publicly-owned distribution utilities). As a result, and all other things being equal, the price of power from these resources is lower. (The extent to which these price advantages represent cost advantages may be arguable; for example, different tax treatment for public resources may affect the distribution of costs and benefits as well as the magnitude of costs and benefits.)

1.3.1.6 The Environmental Cost Profile of Washington's Generation

Most conventional forms of electrical generation carry significant environmental costs. Some of these costs are internalized in the form of pollution controls or fish and wildlife mitigation requirements, for example. Others, such as health impacts due to air emissions, remain external to the price of power, but are significant costs nonetheless. In Washington, significant environmental costs of the existing system include:

- Damage to fish and wildlife, particularly to threatened and endangered anadromous fish, associated with hydropower development
- Air quality, human health, and ecosystem impacts associated with extraction of fossil fuels and emissions from fossil-fueled generating resources.
- Prospective or current changes to local ecosystems (including hydrology, forests, ocean temperatures, sea levels, etc.) and human health impacts associated with climate change.
- The risk of health impacts associated with radioactivity released from nuclear power plants or their waste products.

Environmental costs are generally difficult to estimate in economic terms. However, the magnitude of these costs can have a significant impact on the overall cost-effectiveness of some resources.

1.3.1.7 Variations in Generation Costs Among Utilities in Washington

Generation costs among Washington utilities reporting data for the HB 2831 study range from a low of .96 cents per kWh to a high of 3.49 cents per kWh. Figure 1.31 below depicts reported costs for generation, transmission, and distribution for each of the utilities reporting under HB 2831.

Figure 1.31 Unbundled Cost Summary by Utility

Utility	Generation [1]	Transmission	Distribution [2]	Total Cost
	cents per kWh			
PacifiCorp	2.50	0.72	1.65	4.88
Puget	3.49	0.55	1.50	5.54
Wash. Water Power	2.82	0.38	1.60	4.80
Benton	2.10	0.53	0.96	3.59
Chelan	0.96	0.06	0.74	1.75
Clark	3.01	0.11	0.77	3.89
Cowlitz	1.98	0.01	0.29	2.29
Grant County	1.38	0.30	0.82	2.51
Grays Harbor	2.53	0.32	1.72	4.57
Snohomish	2.75	0.20	1.88	4.84
City of Richland	2.65	0.01	1.07	3.74
Seattle City Light	1.86	0.36	1.70	3.92
Tacoma Utilities	2.55	0.14	0.84	3.53
Washington State (Surveyed Utilities)	2.66	0.36	1.33	4.34
Low	0.96	0.01	0.29	1.75
High	3.49	0.72	1.88	5.54

Source UTC. *Washington Electric Service Quality, Reliability, Disclosure and Cost Report.* December 1, 1998 ("2831 Study")

1) Includes demand side management, non-hydro renewables, fish & wildlife mitigation, and control areas services as per 2831 study.

2) Includes customer account services, metering and billing, and "other" costs as per 2831 study.

1.3.2 Transmission

1.3.2.1 Transmission System Characteristics

The West, and particularly the Northwest, is more dependent on the transmission of power over the interstate, high-voltage grid than is the rest of the country. Much of the Northwest's generating capacity is located along the Columbia and Snake Rivers in eastern Washington and Idaho, or at coal fields in Montana or Wyoming, far from load centers in the Puget Sound area and the Willamette Valley.

The region's generation is tied to load by an extensive high-voltage transmission network that is dominated by the federal system. Bonneville was authorized by the Bonneville Project Act of 1937 to "set rates to extend the benefits of an integrated transmission system and encourage the widest possible diversified use of Federal power." This authority was broadened by the Transmission System Act of 1974,

which directed the BPA Administrator to build transmission facilities "within the Pacific Northwest as [s/he] determines are appropriate and required to: (a) integrate and transmit the electric power from existing or additional Federal or non-Federal generating units; (b) provide service to the Administrator's customers; (c) provide interregional transmission facilities; or (d) maintain the electrical stability and electrical reliability of the Federal system."

Bonneville has used this authority to construct an extensive federally-owned transmission system, including some transmission facilities that are only marginally connected to the FCRPS such as the 500 kV lines that connect Montana Power's Colstrip lines to the Northwest. As a result, the federal system accounts for some 80% of the region's high-voltage transmission wire.

1.3.2.2 Variations in Transmission Costs among Washington Utilities

On average, transmission accounts for around 10% of total costs for Washington utilities. However, costs for transmission vary greatly among Washington utilities. Transmission costs reported by utilities in the unbundled cost report for HB 2831 ranged from .72 to .0089 cents per kWh. (Using the uniform cost allocation methodology developed for the IndeGO proposal, transmission costs for these same utilities ranged from a high of .3795 cents per kWh to a low of .1918 cents per kWh. Transmission costs by utility are included in Figure 1.31.)

Variations in transmission costs among Washington utilities may be attributable to a variety of factors, including but not limited to: the extent to which they own their own transmission and/or generation; distances between loads and generation; load factor (the relationship of peak demands to average consumption); and geographic factors.

1.3.2.3 External Costs of Transmission

Environmental costs associated with the transmission system are primarily related to siting concerns. High-voltage transmission facilities require wide rights-of-way from which all vegetation must be cleared and along which roads must be maintained. Typical issues that would be raised in an environmental impact statement therefore include the impact on wetlands, wildlife, and wilderness areas. Visual impacts and cultural impacts are often of concern to communities affected by high-voltage transmission lines. Some studies suggest that prolonged exposure to electromagnetic fields (EMFs), such as one would experience living near a high-voltage transmission line, may cause cancer. Other studies have found no link between electromagnetic fields and cancer. Research continues into whether such a link exists.

1.3.3 Distribution

1.3.3.1 Variations in Distribution Costs among Washington Utilities

Differences in density are commonly cited as the primary reason why distribution system costs vary among utilities. Utilities with a large proportion of their customers in rural areas have more miles of line to construct and maintain on a per customer basis. This makes costs higher for utilities that are predominantly rural. The data collected for the 6560 and 2831 studies show that there is a strong countervailing factor, however. Constructing and maintaining distribution lines is more expensive in urban areas than in rural areas on a per mile basis, due to higher costs for rights of way, higher percentage of wires underground, more expensive labor, and a number other reasons. Cost per mile shows a strong inverse relationship to density.

The result is that the cost per kWh doesn't vary nearly as much as one might expect, at least among the utilities that reported data for the unbundling study. Distribution costs reported under 2831 ranged from .72 to 1.85 cents per kWh. However, distribution costs per mile of line ranged from $7,241 per mile to $81,290 per mile.

Another way to compare distribution system costs is to look only at the distribution system costs that are allocated to residential customers. This should correct for the fact that some utilities have higher concentrations of industrial customers, which would result in lower system-wide costs on a per-kWh basis. Residential distribution costs vary from a low of 1.26 cents per kWh to a high of 2.39 cents per kWh. Rural, eastside utilities generally show lower costs on a per kWh basis. However, customers of these utilities consume more electricity per year than customers in more urbanized areas, in part because they may have less access to natural gas for heating. The result is that customers in those areas often pay more, on an annual basis, for distribution services despite the lower unit price. Annual residential distribution costs ranged from $206 to $480 per customer. Distribution costs by utility are presented in Figure 1.31.

1.3.3.2 External costs of distribution

The environmental costs associated with the distribution system are similar to those described above for transmission wires. Concerns about visual impacts, in addition to reliability considerations, have caused many utilities to begin putting wires underground, at least for new developments. Concerns about EMFs have generated resistance to siting facilities such as substations in neighborhoods.